Decrease of Force or Matter Relative to Distance

Time:
30 minutes

Objective:
The student individually and as a class will come to see that for matter or energy that emanates equally in all directions from a source will decrease in density in a regular manner. It is hoped that the high school student can be led to find the inverse square relationship that the numbers should approximate.

Content Standards:
Abilities necessary to do scientific inquiry
Understandings about scientific inquiry
Identify questions and concepts that guide scientific investigations
Recognize and analyze alternative explanations and models

Equipment, Materials, and Tools:
Paper, rulers,
Protractors, and
Colored pencils for whole class.

Instructions:
Students may work individually or in groups.

Have each student take piece of paper and draw a point in the middle of the left edge. From this point have students draw lines (arrows) with a protractor radiating out every 5 degrees.
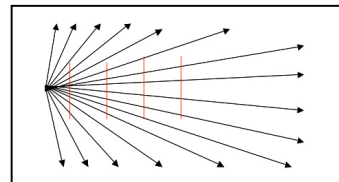
Have students draw a three inch long line at a distance of two inches in from the point and parallel to the edge using a different color to represent a detector = D1.

Have students draw three more detectors (D2, D3, D4) parallel at distances four, six and eight inches respectfully. (More detectors and counts can be added as time permits.)

Have students count the number of rays that cross each detector and record that number by their detector (C1 # of counts, C2 # of counts, C3 # of counts, C4 # of counts).

Have students calculate the ratios D2/D1, D3/D1, D4/D1, C2/C1, C3/C1, C4/C1 (If these ratios are calculated on a spreadsheet the graphs of them with the D's being on the x axis and the C's being on the axis will show the quadratic nature of the decrease.)

Have students record their results on the board. When all of the results have been recorded, have student look to see if the results reveal a 1/distance squared relationship (look at C ratios)

Conduct a class discussion on the results.